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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF	:
FRANCK MARANDON	EXAMINER: WIESE
SERIAL NO: 10/577,559	:
FILED: JANUARY 26, 2007	ART UNIT; 1793
FOR: TEMPERED GLASS FOR THERMAL INSULATION	:

DECLARATION UNDER 37 C.F.R. § 1.132

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

SIR:

I, René Gy, state that:

1. I am the head of the Thermics, Mechanics and Modeling Department at Saint-Gobain Recherche located at 39 quai Lucien Lefranc, F-93300 Aubervilliers, France.

2. I have 24 years experience in the field of glass mechanics.

3. I have read and understood the above-identified application as well as the claims that are presented to the USPTO.

4. I understand that the USPTO has rejected the claims of this application as obvious in view of the combination of Forker (US 4,483,700) and Craver (US 4,817,585). In addition, the Examiner also rejected the claims as obvious in view of Forker with Plumat (US 4,048,978) and also with Gerhardinger (US 6,024,084).

5. The claims of this application define the glass as *the interdiffusion coefficient at 490°C of the exchanged alkali metal ions is less than* $2 \cdot 10^{-15}\ m^2.s^{-1}$.

6. As I explained previously, the glass of Forker is not the same as the glass defined in the claims of the above-referenced application. However, I understand the USPTO has considered my previous calculations but found them to be unpersuasive. In particular, the USPTO critiqued the reliance on general teachings regarding soda-lime silicate glasses as insufficient to establish what constitutes Forker's glass. Therefore, I know present an additional manner of calculating the interdiffusion coefficient based on evidence from Forker himself.

7. In table 1 col 6 of Forker, it is apparent that in 25 hours (i.e. 25 x 3600 seconds = 90000 sec) at 535°C, the exchange depth is 12.7 mils (= 322 μm = 322.10^{-6} m).

8. The relation between the depth of alkali metal ion exchange, the interdiffusion coefficient $D_{(T)}$ of exchanged alkali metal at a temperature T and the time t of exchange is:

$d_e = 4\sqrt{D_{(T)}t}$

Thus, $D_{(T)} = d_e^2 / 4^2.t$

Thus, the glass of Forker is such that:

$D_{(535)} = (322.10^{-6})^2 / 4^2.90000 = 7.2\ 10^{-14}\ m^2.s^{-1}$

It is known that:
$\ln[D_{(T1)}/D_{(T2)}] = DH\ (T1 - T2) / R\ .\ T1.T2$

in which:

$D_{(T1)}$ is the interdiffusion coefficient of exchanged alkali metal at a temperature T1 ;
$D_{(T2)}$ is the interdiffusion coefficient of exchanged alkali metal at a temperature T2 ;
DH is the activation energy of the interdiffusion of the alkali metal
R is the constant of the perfect gases (= 8,32 J/K.mol)

Thus,

$$DH = \frac{\ln[D_{(T1)}/D_{(T2)}]}{(T1 - T2) / R\ .\ T1.T2}$$

and

$$DH = \frac{R\ .\ T1.T2\ .\ \ln[D_{(T1)}/D_{(T2)}]}{(T1 - T2)}$$

9. In assuming that the glass of Forker is at the limit of the interdiffusion coefficient at 490°C of the exchanged alkali metal ions, i.e., $2 \cdot 10^{-15}$ m².s^{-1}, this would imply that (note that 535°C = 808 Kelvin and 490°C = 763 Kelvin):

$$DH = \frac{8{,}32 \cdot 808.763 \cdot \ln[D_{(535)}/D_{(490)}]}{(808 - 763)}$$

$$DH = \frac{8{,}32 \cdot (6.2\ 10^{5}) \cdot \ln[7.2\ 10^{-14} / 2.\ 10^{-15}]}{45}$$

$$DH = \frac{8{,}32 \cdot (6.2\ 10^{5}) \cdot 3.58}{45}$$

DH = 410379 J/mol = 410,4 kJ/mol

9. If the glass of Forker has an interdiffusion coefficient at 490°C of the exchanged alkali metal ions **less than $2 \cdot 10^{-15}$ m².s^{-1}**, the **DH would be higher**.

10. On the other hand, the glass of Forker (US 4,483,700) is a soda-alumino-silicate glass, for which the activation energy of the interdiffusion of the alkali metal ions is known to be less than this value. This can be shown for instance from data published in another patent of Forker (US 3,773,489) where the depth of compression (5 mils) for the **same glass** (see col 4 line 54) is given for 24 hours at 500 °C (see col 5 lines 44-46). However, we know from US 4,483,700 the depth of compression for the same glass at 535 °C for 25 hours : 12.7 mil (see table 1). Therefore, for this glass D(535)/ D(500) is $(24/25)x(12.7/5)^2 = 6.19$.

Since

$$DH = \frac{R \cdot T1.T2 \cdot \ln[D_{(T1)}/D_{(T2)}]}{(T1 - T2)},$$

$$DH = 8.32 \times 773 \times 808 \times \ln[6.19] / 35 = 270.6 \text{ kJ/mol}$$

Thus, the activation energy for the interdiffusion of metal alkali ions in the glass of Forker can be shown to be 270.6 kJ/mol.

This is much lower than above calculated 410.4 kJ/mol.

11. This clearly demonstrates that the glass of Forker is not such that "*the interdiffusion coefficient at 490°C of the exchanged alkali metal ions is less than* $2 \cdot 10^{-15}$ $m^2.s^{-1}$ " as defined in the claims of the above-identified application.

12. As the glass of Forker has an interdiffusion coefficient at 490°C of the exchanged alkali metal ions much higher than in the glass defined in the claims, at high temperature, the glass of Forker will rapidly loss its state of tempered glass and its mechanical properties.

13. The undersigned declares that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of this application or any patent issuing thereon.

Signature

November 17th, 2011
Date